spinocerebellar ataxia type 2

Spinocerebellar ataxia type 2 (SCA2) is a condition characterized by progressive problems with movement. People with this condition initially experience problems with coordination and balance (ataxia). Other early signs and symptoms of SCA2 include speech and swallowing difficulties, rigidity, tremors, and weakness in the muscles that control eye movement (ophthalmoplegia). Eye muscle weakness leads to a decreased ability to make rapid eye movements (saccadic slowing).

Over time, individuals with SCA2 may develop loss of sensation and weakness in the limbs (peripheral neuropathy), muscle wasting (atrophy), uncontrolled muscle tensing (dystonia), and involuntary jerking movements (chorea). Individuals with SCA2 may have problems with short term memory, planning, and problem solving, or experience an overall decline in intellectual function (dementia).

Signs and symptoms of the disorder typically begin in mid-adulthood but can appear anytime from childhood to late adulthood. People with SCA2 usually survive 10 to 20 years after symptoms first appear.

Frequency

The prevalence of SCA2 is unknown. This condition is estimated to be one of the most common types of spinocerebellar ataxia; however, all types of spinocerebellar ataxia are relatively rare. SCA2 is more common in Cuba, particularly in the Holguín province, where approximately 40 per 100,000 individuals are affected.

Genetic Changes

Mutations in the *ATXN2* gene cause SCA2. The *ATXN2* gene provides instructions for making a protein called ataxin-2. This protein is found throughout the body, but its function is unknown. Ataxin-2 is found in the fluid inside cells (cytoplasm), where it appears to interact with a cell structure called the endoplasmic reticulum. The endoplasmic reticulum is involved in protein production, processing, and transport. Researchers believe that ataxin-2 may be involved in processing RNA, a chemical cousin of DNA. Ataxin-2 is also thought to play a role in the production of proteins from RNA (translation of DNA's genetic information).

The *ATXN2* gene mutations that cause SCA2 involve a DNA segment known as a CAG trinucleotide repeat. This segment is made up of a series of three DNA building blocks (cytosine, adenine, and guanine) that appear multiple times in a row. Normally, the CAG segment is repeated approximately 22 times within the gene, but it can be repeated up to 31 times without causing any health problems. Individuals with 32 or more CAG repeats in the *ATXN2* gene develop SCA2. People with 32 or 33 repeats

tend to first experience signs and symptoms of SCA2 in late adulthood, while people with more than 45 repeats usually have signs and symptoms by their teens.

It is unclear how the abnormally long CAG segment affects the function of the ataxin-2 protein. The abnormal protein apparently leads to cell death, as people with SCA2 show loss of brain cells in different parts of the brain. Over time, the loss of brain cells causes the movement problems characteristic of SCA2.

Inheritance Pattern

This condition is inherited in an autosomal dominant pattern, which means one copy of the altered gene in each cell is sufficient to cause the disorder. An affected person usually inherits the altered gene from one affected parent. However, some people with SCA2 do not have a parent with the disorder. Individuals who have an increase in the number of CAG repeats in the *ATXN2* gene, but do not develop SCA2, are at risk of having children who will develop the disorder.

As the altered *ATXN2* gene is passed down from one generation to the next, the length of the CAG trinucleotide repeat often increases. A larger number of repeats is usually associated with an earlier onset of signs and symptoms. This phenomenon is called anticipation. Anticipation tends to be more prominent when the *ATXN2* gene is inherited from a person's father (paternal inheritance) than when it is inherited from a person's mother (maternal inheritance).

Other Names for This Condition

- SCA2

Diagnosis & Management

Genetic Testing

- Genetic Testing Registry: Spinocerebellar ataxia 2
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0752121/

Other Diagnosis and Management Resources

- GeneReview: Spinocerebellar Ataxia Type 2
  https://www.ncbi.nlm.nih.gov/books/NBK1275

General Information from MedlinePlus

- Diagnostic Tests
  https://medlineplus.gov/diagnostictests.html
- Drug Therapy
  https://medlineplus.gov/drugtherapy.html
- Genetic Counseling
  https://medlineplus.gov/geneticcounseling.html

- Palliative Care
  https://medlineplus.gov/palliativecare.html
- Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html

Additional Information & Resources

MedlinePlus

- Encyclopedia: Movement--Uncoordinated
  https://medlineplus.gov/ency/article/003198.htm
- Health Topic: Balance Problems
  https://medlineplus.gov/balanceproblems.html
- Health Topic: Cerebellar Disorders
  https://medlineplus.gov/cerebellardisorders.html
- Health Topic: Movement Disorders
  https://medlineplus.gov/movementdisorders.html

Genetic and Rare Diseases Information Center

- Spinocerebellar ataxia 2
  https://rarediseases.info.nih.gov/diseases/4072/spinocerebellar-ataxia-2

Additional NIH Resources

- National Institute of Neurological Disorders and Stroke: Ataxias and Cerebellar or Spinocerebellar Degeneration Information Page
  https://www.ninds.nih.gov/Disorders/All-Disorders/Ataxias-and-Cerebellar-or-Spinocerebellar-Degeneration-Information-Page

Educational Resources

- Disease InfoSearch: Spinocerebellar ataxia 2
  http://www.diseaseinfosearch.org/Spinocerebellar+ataxia+2/6753
- Johns Hopkins Medicine Department of Neurology and Neurosurgery: What is Ataxia?
  http://www.hopkinsmedicine.org/neurology_neurosurgery/centers_clinics/movement_disorders/ataxia/conditions/
- National Ataxia Foundation: Spinocerebellar Ataxia Type 2
  http://www.ataxia.org/pdf/NAF%20Web%20Content%20Publication%20SCA2.pdf
- Washington University, St. Louis: Neuromuscular Disease Center
  http://neuromuscular.wustl.edu/ataxia/domatax.html#sca2

Patient Support and Advocacy Resources

- Family Caregiver Alliance
  https://www.caregiver.org/
- Merck Manual Home Edition for Patients and Caregivers: Coordination Disorders
  http://www.merckmanuals.com/home/brain-spinal-cord-and-nerve-disorders/movement-disorders/coordination-disorders
- National Ataxia Foundation
  http://www.ataxia.org/
- National Organization for Rare Disorders (NORD): Autosomal Dominant Hereditary Ataxia
  https://rarediseases.org/rare-diseases/autosomal-dominant-hereditary-ataxia/
- University of Kansas Medical Center Resource List: Ataxia
  http://www.kumc.edu/gec/support/ataxia.html

GeneReviews

- Spinocerebellar Ataxia Type 2
  https://www.ncbi.nlm.nih.gov/books/NBK1275

ClinicalTrials.gov

- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22spinocerebellar+ataxia+type+2%22+OR+%22Spinocerebellar+Ataxias%22

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Spinocerebellar+Ataxias%5BMAJR%5D%29+AND+%28%28spinocerebellar+ataxia+type+2%5BTIAB%5D%29+OR+%28sca2%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22%5Bdp%5D

OMIM

- SPINOCEREBELLAR ATAXIA 2
  http://omim.org/entry/183090

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  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20070987

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